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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/709,372

04/30/2004

Ko-Hsing Chang

12409-US-PA

3371

31561

7590

02/04/2005

JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE  
7 FLOOR-1, NO. 100  
ROOSEVELT ROAD, SECTION 2  
TAIPEI, 100  
TAIWAN

EXAMINER

TRAN, MAI HUONG C

ART UNIT

PAPER NUMBER

2818

DATE MAILED: 02/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/709,372	Applicant(s) CHANG ET AL.	
	Examiner Mai-Huong Tran	Art Unit 2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 07 January 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) 11-18 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Election/Restriction***

Application's election without traverse of Group I (Claims 1-10) drawn to a semiconductor device is acknowledged for prosecution in the subject application. Accordingly, claims 11-18 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Applicants have the right to file a divisional application covering the subject matter of the non-elected claims.

### **Specification**

The specification is objected to for the following reasons.

In paragraph [0031], the specification includes incorrect reference sign 'charge-trapping layer 201b'. It should be 'charge-trapping layer 210b'. Correction is required.

### **Claim Rejections - 35 U.S.C. § 102**

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this

subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-10 are rejected under 35 U. S. C. § 102 (e) as being anticipated by U.S. Patent No. 6,486,028 to Chang et al. (hereinafter Chang).

Regarding to claim 1, Chang discloses a non-volatile memory cell comprising a substrate 100, having a trench 102 thereon; a gate 116, formed within the trench 102; a first source/drain region 108, formed at a bottom of the trench 102; a composite dielectric layer 110, 112, 114, formed between the gate 116 and a surface of the trench (fig. 5), wherein the composite dielectric layer comprises at least a charge-trapping layer 112; and a second source/drain region 104, 106, formed in the substrate 100 on each side of the gate 116 (col. 3, lines 13-63, and fig. 6).

Regarding to claim 2, the non-volatile memory cell wherein the gate 116 completely fills the trench 102 (fig. 6).

Regarding to claim 3, the non-volatile memory cell wherein the gate fills the trench the trench and protrudes above the substrate surface (fig. 6).

Regarding to claim 4, the non-volatile memory cell wherein the gate further laterally extend above the substrate outside the trench (fig. 6).

Regarding to claim 5, the non-volatile memory cell wherein the composite dielectric layer also laterally extend above the substrate outside the trench and positioned between the gate and the substrate (fig. 6).

Regarding to claim 6, the non-volatile memory cell wherein the composite dielectric layer further comprises a bottom oxide layer 110, wherein the charge-trapping layer 112 located between the gate 116 and the bottom oxide layer 110; and a cap oxide layer 114, located between the gate 116 and the charge-trapping layer 112 (fig. 6).

Regarding to claim 9, the non-volatile memory cell wherein material constituting the gate comprises polysilicon (col. 4, lines 22-24).

Regarding to claim 10, the non-volatile memory cell wherein the composite dielectric layer comprises a silicon oxide/silicon nitride/silicon oxide layer (col. 3, lines 53-56, fig. 6).

### **Claim Rejections - 35 U.S.C. § 103**

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 7 and 8 are rejected under 35 U.S.C. 103 (a) as being unpatentable over U.S. Patent No. 6,486,028 to Chang in view of Forbes (US pub. No. 2003/0235076).

Regarding to claim 7, Chang discloses the claimed invention except for the non-volatile memory cell further comprising spacers formed on the sidewalls of the gate. Forbes teaches the non-volatile memory cell further comprising spacers formed on the sidewalls of the gate (page 6, [0058], and fig. 7A).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the non-volatile memory cell further comprising spacers formed on the sidewalls of the gate, as taught by Forbes in order to improve a multistate NROM operate with lower programming voltages than that used by conventional DRAM cells, yet still hold sufficient charge to withstand the effects of parasitic capacitances and noise due to circuit operation.

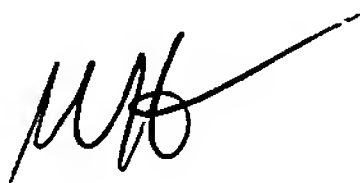
Regarding to claim 8, Forbes discloses the non-volatile memory cell further comprising a lightly doped region formed in the substrate underneath the spacers (page 7, [0060], and figs. 7A, 7B).

### Conclusion

Any inquiry concerning this communication on earlier communications from the examiner should be directed to Mai-Huong Tran, (571) 272-1796. The examiner can normally be reached on Monday-Thursday from 8:00 AM to 6:30 PM. The examiner's supervisor, David Nelms can be reached on (571) 272-1787.

The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR, Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Mai-Huong Tran